SELF-ALIGNING PRINT HEAD MECHANISM AND RELATED PRINTER AND METHOD

TECHNICAL FIELD

The present invention relates to printers and, more particularly, to printers that utilize a print head alignment system.

BACKGROUND

Printers are used for marking various indicia on labels and the like. Label stock or other print media moves through the printer such that it passes between a print head and a print roller whereby the label stock is marked by the print head. As the label stock continuously moves through the printer, pieces of the label stock may become jammed between the print roller and the print head, making them difficult to remove. Furthermore, in many applications a variety of types of label stock are used, creating a need for the ability to easily remove and replace label stock. At the same time, maintaining proper alignment and relatively uniform pressure between the print roller and print head during printing is important to print quality.

Accordingly, there is a need for a printer having a print head alignment system such that the print head may be properly aligned with the print roller while at the same time allowing for an access space to be created between the print head and the print roller.

SUMMARY

In one aspect, a printer for printing between a print roller and a print head includes a print head alignment system. A print roller assembly has a print roller mounted thereon and at least one stop. A print head support assembly has a print head mounted thereon and at least one detent, a surface of said detent engaging a surface of said stop to maintain alignment of said print head with said print head roller. An actuating assembly is associated with one of said print head support assembly and said print roller assembly for movement thereof so as to back one of the detent and the stop away from the other of the detent and the stop before moving the one of the print head support assembly and the print roller assembly so as to provide an access space between said print head and said print roller for allowing print media to be removed and inserted.

In another aspect, a print head alignment system is provided that includes a frame, a print roller support extending from the frame and having at least one stop and a print roller, and a print

head support assembly including a pivot frame pivotally attached at one end to pivot around a pivot axis, two spaced apart wheels rotatably attached to the pivot frame and a heat sink supporting a print head and having at least one detent. The heat sink is mounted for movement relative to the pivot frame to permit a distance between the print head and the pivot axis to be varied. A print head elevator having two spaced apart rails is also provided for supporting the spaced apart wheels. Each of the spaced apart rails includes a respective ramp portion. The print head elevator is movable relative to the pivot frame in a first direction causing the wheels to ride up the ramp portion to elevate the print head and heat sink and place the at least one detent into vertical alignment with the at least one stop.

In still another aspect, a method for disengaging a print head support assembly from a print roller assembly wherein the print roller assembly includes at least one substantially vertical stop surface engaged with at least one substantially vertical detent surface of the print head support assembly maintaining alignment of the print head and print roller is provided. The method includes a first step of moving one of said print head support assembly and said print roller assembly in a first direction to space said detent surface from said stop surface. A second step involves moving at least one side of said one of said print head support assembly and said print roller assembly in a second direction away from the other of said print head support assembly and said print roller assembly to provide an access space between said print head and said print roller for allowing print media to be removed and inserted.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention can be understood with respect to the following drawings. In the drawings, like referenced numerals designate corresponding parts throughout the several views. Also, the components in the drawings are not necessarily to scale.

Fig. 1 is a front perspective view of the print head alignment system of the present invention;

Fig. 2 is a bottom perspective view of the print head alignment system of Fig. 2, with actuating assembly partially actuated;

Fig. 3 is a bottom perspective view of the print head alignment system of Fig. 2, with the actuating assembly fully actuated;

Fig. 4 is a front perspective view of the print head alignment system of Fig. 2 positioned in a printer frame;

Fig. 5 is a front perspective view of a portion of the print head alignment system of Fig. 1 creating an access space;

Fig. 6 is a side elevational view of a portion of the print head alignment system of Fig. 6 with the detents engaging the stops; and

Fig. 7 is a side elevational view of a portion of the print head alignment system of Fig. 6 with the detents engaged with the stops.

DETAILED DESCRIPTION

As shown in Fig. 1, the illustrated print head alignment system, generally designated 10, includes a print roller assembly 12, a print head support assembly 14 and an actuating assembly 16. Figs. 4 and 5 illustrate the alignment system positioned within a printer.

The print roller assembly 12 is connected to the frame 17 of the printer and includes a print roller 20, a rod 21 and two spaced apart side plates 23, each with a respective stop 22 (the second stop is not shown). The two plates 23 define two walls of the print roller assembly 12 and each plate 23 includes a hole 25 for receiving the rod 21 and a stop 22 positioned in a lower portion of each plate 23. The print roller 20 is coaxially mounted on the rod 21.

The print head support assembly 14 includes a pivot frame 36, rod 38, heat sink 30 and a print head 33 mounted on the heat sink 30. The pivot frame 36 includes two spaced apart holes 40 located at a rear portion 37 of the pivot frame 36. Rod 38 is received through the holes 40 and is connected to the printer frame 17 (as by threaded bolts) such that the pivot frame 36 is pivotally attached to the printer frame 17 by rod 38 allowing the pivot frame 36 to pivot about a pivot axis of rod 38. The pivot frame 36 further includes two spaced apart wheels 42 rotatably attached to the pivot frame 36 at a central portion of the pivot frame 36. The heat sink 30, having the print head 33 attached thereto, is mounted to the pivot frame 36 at a forward portion 39 of the pivot frame 36.

The heat sink 30 includes two spaced apart detents 32 (the second detent is not shown) located at an upper portion of the heat sink 30. The detents 32 have a surface 34 for engaging a surface 35 of the stops 22 to maintain alignment of the print head 33 with the print roller 20 as shown in Fig. 1.

The heat sink 30 is mounted for movement relative to the pivot frame 36 by a spring-loaded connection 50. The spring-loaded connection 50 permits adjustment of the distance between the heat sink 30 and the rod 38. The spring-loaded connection 50 includes a securing member 52 and a spring 54 disposed about a center pivot shaft 51 that extends forward to the heat sink 30 and about which the heat sink 30 is pivotally connected. The securing member 52 is located at rear portion 37 of the pivot frame 36, with rod 38 extending therethrough, such that the securing member 52 is maintained at the rear portion 37 of the pivot frame 36. The securing member 52 is capable of rotating about the pivot axis of the rod 38. The spring 54 and center shaft 51 connect the securing member 52 to the heat sink 30 such that the heat sink 30, and corresponding print head 33, can both pivot about an axis of the center shaft 51 relative to the pivot frame 36 and move axially along the center shaft.

The heat sink 30 is connected to the forward portion 39 of the pivot frame 36 by a spring 75 disposed about a shaft, a pressure washer 76 and a lock nut 77, which extends from an opening in the front portion 39 of the pivot frame 36 (see Figs. 2 and 3), such that some movement of the heat sink 30 relative to the forward portion 39 of the pivot frame is permitted. The spring 75, or other biasing member, urges the heat sink 30 and corresponding print head 33 upward towards the print roller 20. As best seen in Fig. 7, the surface 34 of the detents 32 and the surface 35 of the stops 22 are engaged in a manner that permits the print head 33 to float slightly in the vertical direction, relative to the print roller 20 during operation of the printer if the surfaces 34 of the detents 32 move along the surfaces 35 of the stops 22.

As seen in Fig. 5, the print head support assembly 14 further includes a print head cover 71 located over the top rear portion of the print head 33. The print head cover 71 includes spaced apart lateral guide members 73 that interact with the bottoms of the side plates 23 of the print roller assembly 12 to orient the print head 33 along an axis of the print roller 20 such that the print head is centered on the print roller 20. As shown in Figs. 4 and 5, a stop 81 is located on the frame 17 and below an inner side 83 of the heat sink 30 to limit downward movement of the inner side 83 of the heat sink 30 and corresponding print head 33 as the print head 33 moves downward away from the print roller 20. However, movement of an outer side portion 85 of the print head 33 is not limited and therefore an access space 87 is created between the print roller 20 and the print head 33, as shown in Fig. 5.

Referring again to Fig. 1, the actuating assembly 16 includes a print head elevator 78 and a manual actuator 79. The print head elevator 78 includes two spaced apart rails 84 for supporting the spaced apart wheels 42 on the print head support assembly 16. Each of the spaced apart rails 84 includes a ramp portion 89 such that the two spaced apart wheels 42 may ride up or down the ramped portion 89 of the rails 84 when the manual actuator 79 moves the print head elevator 78.

Referring to Figs. 2 and 3, the manual actuator 79 includes a print head lever 90, a print head lever shaft 92, a link 94 and a rod 97. The print head lever 90 is connected to the print head lever shaft 92 that coaxially receives the rod 97. As shown in Fig. 4, the rod 97 is fixedly connected to the printer frame 17 by screws 99 or the like, such that the print head lever shaft 92 may rotate about the rod 97. The print head lever shaft 92 is rotatably connected to the link 94 that in turn is rotatably connected to rear end of the elevator 78. The two spaced apart rails 84 are located at a forward portion 86 of the elevator 78.

Fig. 2 represents the orientation of the components when the print head 33 is aligned with the print roller 20 for printing as per Fig. 1, while Fig. 3 represents the orientation of the components when the print head 33 as been disengaged from the print roller 20 to create the print media access space 87 as per Fig. 5. A lever 110, including arms 112 and 114, is positioned between the elevator 78 and the heat sink 30 as shown in Fig. 3, and is pivotally mounted to the underside of the pivot frame 36. The print head 33 is disengaged from the print roller 20 by rotating the print head lever 90 in the direction shown by arrow 93, such that the print head lever shaft 92 rotates about the rod 97 and moves the link 94 in the direction shown by arrow 120 (Fig. 2), thereby withdrawing the elevator 78 in the direction 120. As the elevator 78 moves in direction 120, a cam surface 121 of a projection 122 that extends upward from the elevator 78 interacts with arm 112 of the lever 110 causing the lever to rotate from the position of Fig. 2 toward the position of Fig. 3. The rotation of the lever 110 causes arm 114 to interact with contact portion 105 of the heat sink 30, thereby pulling the heat sink 30 away from the print roller assembly 14 (direction 120) so that the detents 32 first back off from the stops 22 into the position reflected in Fig. 6 before the print head 33 moves downward away from the print roller 20. As the elevator 78 continues to be withdrawn in the direction 120, the surface of the elevator projection 122 is arranged so that the lever 110 stops rotating but is maintained in position to

hold the detents 32 in the backed off position from the stops 22. Next, the pivot frame wheels 42 ride down the ramp 89, as reflected in Fig. 3, and the print head 33, the heat sink 30 and the pivot frame 36 rotate about a pivot axis defined by the axis of rod 38. At the same time the heat sink 30 rotates about the axis of center pivot shaft 51, thereby creating access space 87 between the print head 33 and the print roller 20 by causing the outer side of the print head support assembly to drop down away from the print roller as per Fig. 5.

Engagement of the print head 33 with the print roller 20 is basically a reverse of the sequence described above. When the print head lever 90 is rotated in the direction shown by arrow 91 (Fig. 3), the print head lever shaft 92 rotates about the rod 97 thereby moving the link 94 in a forward direction shown by arrow 96, thereby advancing the elevator 78 in the forward direction 96. As the elevator 78 advances in the forward direction 96, the wheels 42 on the print head support assembly 14 ride up the ramp portions 89 of the rails 84 to move the detents 32 upward into the position shown in Fig. 6. As the elevator 78 is moved further in direction 96, the cam surface 121 of elevator projection 122 permits the lever 110 to rotate back toward the position reflected in Fig. 2, allowing the detents to move forward into the position against the stops as shown in Fig. 7. In one embodiment the bias of spring 54 may be sufficient to automatically move the print head support assembly forward when the lever 110 rotates to the position of Fig. 2. In another embodiment, the detents 32 may remain in the backed off position of Fig. 6 until the print roller 20 is operated to feed label stock, with the movement of the label stock interacting with the print head 33 to pull the print head support assembly forward so that the detents 32 engage the stops 22 as shown in Fig. 7. When the elevator 78 is in the fully actuated, forward position, the spring 75 may bias the heat sink 30 and corresponding print head 33 to maintain proper engagement with the print roller 20.

Although a specific embodiment is shown and described above, equivalents and modifications will occur to those skilled in the art upon reading and understanding this specification. For example, while the illustrated embodiment contemplates that the print roller assembly is in a fixed position within the printer and the print head support assembly is moved to create the media access space, it is recognized that embodiments in which the print head and heat sink are fixed and the print roller assembly is moved to create the medic access space are possible, in which case the pivot frame and elevator could be associated with the print roller

assembly to cause the stops 22 to move away from the detents 32 before the print roller moves away from the print head. Further, while the print roller assembly is shown in an orientation placing the print roller above the print head, it is recognized that other orientations are possible, including orientations in which the print head is above the print roller. The present application includes all such modifications and variations and is limited only by the scope of the claims.

What is claimed is: